

supposing that these difficulties be got over, the age of the deposit in which these fragments are stated to have been found is a matter of dispute in which the authorities are about equally balanced on either side.

The asserted inter-glacial age of the river gravels containing palæolithic implements proved equally unsatisfactory. The cases supposed to be decisive of the question in the neighbourhood of Brandon and Thetford, were considered by Prof. Hughes to throw no light upon it, since the deposits above them, supposed to be boulder clay, are not boulder clay *in situ*. It was forcibly urged by several speakers, and especially by Prof. Prestwich, that the flint implement-bearing strata are proved by their position in the valleys to be later than the glaciation of the district, in every case where it has been glaciated, or in other words, that they are decidedly of post-glacial age.

The general question of the antiquity of man in Europe was not discussed, although we gathered that the evidence of the presence of man in the Italian pleiocenes was not considered satisfactory. The general impression left upon our minds is that in Britain there is no evidence of any palæolithic men, either in caves or the river-deposits of an age older than post-glacial, and that the discoveries of the last fourteen years have merely given us interesting details as to the palæolithic savage, without telling us anything of his relation to the glacial period.

THE VALUE OF NATURAL HISTORY MUSEUMS

WELL-arranged museums are valuable to the state in many ways. The technological department ought to show in what new directions capital may and may not be invested; the geological and mineralogical should point out in what kind of rock and in what parts of the earth's crust ores and minerals are to be sought, and should save the expenditure of money in useless trials. The museum of the Royal School of Mines in Jermyn Street performs these functions. But they are valuable in a still higher sense as encouraging a love of knowledge for its own sake apart from any selfish aims. The visitors to the British Museum, however frivolous they may be, leave it all the better for having been there. It is impossible that they should not carry away some sort of idea, which otherwise would not have occurred to them, even if it be merely the recognition that outside their daily lives there is a world of knowledge vast and indefinite, but real and tangible. In this respect museums are educators of the masses, offering them a means of culture which would otherwise be out of their reach. And lastly, as instruments of training in natural history they are, as I have already observed, as necessary to the student as collections of books to the student in arts.

Natural history pursuits are in themselves one of the forms of higher education, and one that is especially adapted for the culture of the lower, sometimes falsely termed the working classes—as if the higher classes worked neither with head nor hand. In proof of this I may quote the following example, which I am free to mention by the death of the man to whom it relates. Some years ago a mechanic, one of the evening class students at Owens College, took me to see a collection of fossils made by

“a hand” in a cotton-mill at Oldham. To my astonishment I found that it consisted not merely of fossils *au naturel*, shells, and the like, but of those of coal plants, polished, and in many cases cut into slices so as to show their minute structure. This had been done by rubbing them down on the kitchen floor, cementing them to a piece of glass, and then grinding them until they became transparent. The care and labour implied in a process of this kind can only be estimated by those who have tried it. But it was necessary to have a microscope to see them, and I actually discovered that the instrument which was given me to use was made by the man himself, who could not afford to buy more than the lenses, which he mounted in tubes that were made to slide in each other after the manner of a telescope. He was also a good local botanist. His collection of fossils, along with another made by a friend of his under similar circumstances, furnished the materials on which Prof. W. C. Williamson has to a great extent founded his admirable memoirs on the coal-plants, now being published by the Royal Society. From time to time I saw a good deal of my friend, and a man more completely lifted out of the usual level of his class into what I may call the unselfish horizon I never met. This could be traced directly to the scientific pursuits to which he was led by seeing somebody one day pick up a piece of coal shale, and hearing him say that there was a fish scale in it. He disbelieved this, examined for himself, took to collecting, and ultimately became what he was, devoting his early mornings and his late evenings not merely to collecting but to knowing. His knowledge embraced other things than natural history. James Whittaker, of Oldham, may be taken as a type of the effect of natural history in elevating a man's character. He is the representative of a small, though very important, body in the Northern Counties, a body which would be largely increased by the foundation of museums of the right sort. From personal contact with men like him I have arrived at the conclusion that in this direction we have a means of spreading culture among the intelligent mechanics, artisans, and mill-hands, who go neither to church nor chapel, who do not read very much, and very often have no aims higher than those of the mere animal life. Had they access to museums on holidays and in the evenings, I am sure that the receipts of public houses would ultimately be lessened. At present they have few recreations and little chance of self-improvement; for the so-called mechanics' institutes, which were originally intended for them, have generally passed into the hands of the class immediately above them.

W. BOYD DAWKINS

PHYSIOLOGICAL ÆSTHETICS

Physiological Æsthetics. By Grant Allan, B.A. 8vo. (London: Henry S. King and Co., 1877.)

WE have here a little work of some 300 pages, which deals with the philosophy of æsthetics almost exclusively on its physiological side. Of course, in thus restricting his subject, the author neglects all the more subtle and intricate parts of that philosophy; but every competent reader will agree with him that it is desirable, for the purpose of analysis, to separate as distinctly as possible the physiological from the psychological elements

of æsthetics. For although the two classes are intimately blended in reality, this only makes it the more desirable to eliminate the one from the other in our analysis; so that we may perceive, as clearly as we can, how much of the total effect which our æsthetic consciousness supplies admits of being resolved into simple constituents, and how much remains over as complex constituents. Now in this respect Mr. Allan has profited well by the experience of previous writers; for while he treats his subject very thoroughly so far as it can be treated on the lower basis of physiology, he never permits himself to be tempted into the alluring superstructure of pure psychology. So rigidly, indeed, does he "stick to his text," that an uninformed reader might peruse the whole essay, and scarcely receive a hint that there is such a thing as "the association theory" in existence; while the names of Burke, Reynolds, Alison, Knight, Stewart, and Jeffrey are not even once mentioned.

The scope of the treatise being thus carefully confined to the more simple factors of our æsthetic emotions, space is afforded for a full exposition of numerous facts and theories relating to this important sub-division of psychological science. And, on the whole, the work has been well done. The arrangement is good, the style admirably lucid, and the spirit throughout scientific. True, there are no ideas of a strikingly original character; but a judicious compilation of facts already known, and a philosophical discussion of the more important theories which have been raised upon them, would be features in a work sufficient of themselves to make the latter a valuable addition to the literature of æsthetics. Mr. Allan, however, has done more than this. In his dedication he characterises his work as a "slight attempt to extend in a single direction the general principles which he (Mr. Herbert Spencer) has laid down;" and in this attempt we must allow that our author has been successful.

Setting out with the object of "exhibiting the purely physical origin of the sense of beauty, and its relativity to our nervous organisation," Mr. Allan begins by "investigating the nature of Pleasures and Pains generally." The most important part of this discussion is that in which he criticises the law thus enunciated by Prof. Bain: "States of pleasure are concomitant with an increase, and states of pain with an abatement, of some, or all, of the vital functions." On this law it is remarked, with justice, "in its endeavour to be antithetical, it misses the real relationship between the two states. If pleasures were the psychical concomitants of an *increase* of the vital functions, then our two greatest, if not our only pleasures ought to be digestion, and repose after exertion. . . . Mr. Bain has sighted this difficulty, but, not perceiving its full force, has endeavoured to avoid it by a supplementary theory of stimulation, which appears to me far more important than his main law. I believe the true principle of connection to be this: Pleasure is the concomitant of the healthy action of any or all of the organs or members supplied with afferent cerebro-spinal nerves, to an extent not exceeding the ordinary powers of reparation possessed by the system. And just as the two laws are not exactly antithetical, so too the feelings themselves are not directly and absolutely opposed to one another as will be seen in the sequel . . . In short, it will be seen that while Prof. Bain refers pleasure to an *increase* in the efficiency

of the organism, it may better be regarded as the concomitant of a *normal amount of activity* in any portion or the whole of the organism." Thus "every activity when not excessive nor of a sort to prove destructive of the tissues, is doubtless in itself faintly pleasurable . . . but owing to the commonness and faintness of the feeling, we habitually disregard it." Nevertheless, when the whole organism is "under the influence of abundant food and good rest, the general stimulation of the nerves produces a consciousness of massive pleasure." Moreover, "the special stimulation of a single organ whose periods of activity are long intermittent, and which is at the culminating point of its nutrition, produces consciousness of acute pleasure." From considerations such as these, illustrated by a large number of subsequent examples, there is deduced the general formula, that "the amount of pleasure is probably in the direct ratio of the number of nerve fibres involved, and in the inverse ratio of the natural frequency of stimulation." Hence it is that the possible intensity of pleasures can never approach the possible intensity of pains; for while the organism, or parts of it; may be reduced or injured to a large extent before loss of sensibility supervenes, "efficient working cannot be raised very high above the average." Hence, too, "the æsthetically beautiful is that which affords the maximum of stimulation with the minimum of fatigue or waste, in processes not directly concerned with vital functions."¹

Such may be said to be the foundation on which the present system of "Physiological Æsthetics" is raised. Thus, to select a few among the copious illustrations which are offered:—"The vulgar are pleased by great masses of colour, especially red, orange, and purple, which give their coarse nervous organisation the requisite stimulus; the refined, with nerves of less calibre but greater discriminativeness," require delicate combinations of *complexmentaries*. Similarly in music, the complex *harmony* of a Bach's fugue pleases the cultured ear, while a chorus of Offenbach, or the boisterous *melody* of a comic song, is more gratifying to the common people. Again, the æsthetic superiority of musical tones over mere noises is naturally explained by the fact, that "while the nervous apparatus for the perception of the latter receives frequent stimulation, each portion of the nervous apparatus for the perception of the former is comparatively seldom stimulated." Similarly, of course, simple tones are musically "poor," because they "can only arouse a sympathetic vibration in a single one of Cortis's organs;" while tones rich in harmonics are musically "full," because they stimulate a correspondingly greater number of Cortis's organs. *Beats*, again, are disagreeable, because "the ear is conscious of each separate interruption of the tone, and each subsequent reinforcement," thus receiving a *destructive* amount of intermittent stimulation. Similarly, though in a lesser degree, with *dissonance*; and similarly, too, with the optic nerve, when flashes of intermittent light follow one another too rapidly for the receptive material

¹ The latter qualification arises from a lengthy discussion in which Mr. Spencer's view as to the origin of the Play-instinct from a superfluity of nervous energy is explained. This is explained in order that the æsthetic feelings, which by the theory are supposed to have a similar origin, may be analytically differentiated from the playful feelings—the distinction between Art and Play being supposed to consist largely in the fact that while the latter has reference to the over-fed motor fibres, the former has reference to the over-fed sensory fibres, "the organs of sight, hearing, &c.," or "the passive side of our nature."

to undergo repair during the intervals of darkness. The æsthetic superiority of the analytic colours over black, white, and grey is explained by considerations analogous to those which have just been mentioned in the case of musical tones and noises; while harmony of colours is treated in the same way as harmony of sounds. A somewhat curious speculation is ventured to explain the apparent deficiency of the red-perceiving elements. "It is clearly desirable that the eyes of the frugivorous animals should be *pleasurably* stimulated by reds, oranges, and purples; and the simplest contrivance for effecting this end would be to give the greatest possible rest to such elements as answer to stimulations of these orders. Accordingly, they ought only to be excited by comparatively powerful stimulations of their proper kinds."

Adopting Mr. Spencer's view¹ as to the ideal being a faint central stimulation of such nerve-fibres as would receive strong peripheral stimulation by the reality, Mr. Allan carries his analysis to the limit where "Physiological Æsthetics" must end, and where Psychological Æsthetics ought only to begin. Space, however, will not allow us to follow him into this division of his subject. Enough has been said to show that his work deserves the attention of psychologists; and it may be added that as he throughout clearly explains both the physics and the physiology of his subject, his entertaining little treatise will prove instructive to any general readers who may be desirous of observing the intimacy of those relations between psychology and the lower sciences, which the magnificent generalisations of recent years are now every day bringing into clearer prominence.

GEORGE J. ROMANES

OUR BOOK SHELF

Select Plants readily Eligible for Industrial Culture or Naturalisation in Victoria, with Indications of their Native Countries and of their Uses. By Baron F. von Mueller, C.M.G., F.R.S., &c. (Melbourne: McCarron, Bird, and Co.)

THIS is another form of Baron Mueller's numerous and widely-spread contributions to the Acclimatisation Society of Victoria—numerous we say, because the Baron's pen is always at work upon botanical matters, the consideration of useful plants being apparently one of his favourite themes, and widely spread, because these papers on "select plants" seem to have been freely distributed not only in Australia and in this country, but also in America, where indeed some portion, if not all, have been republished. The present issue, Baron Mueller tells us, is a rearranged and largely supplemented form, which has been taken up by the Government of Victoria, and published under their authority. The book, which numbers some 293 pages octavo, contains references to an immense number of plants, the information attached to each being brief but withal accurate. The generic and specific names are arranged alphabetically from beginning to end, and this arrangement is perhaps the best for general use. After the scientific name, the vernacular name is given, then the geographical distribution or habitat, followed by a note as to the nature of the plant, whether a tree, shrub, or what not, and finally a brief description of its properties and uses. As a proof that Baron Mueller

¹ Here, as indeed in most other places, Mr. Allan does not express his obligations. Doubtless, having a psychological public in view, he thought it superfluous to state the sources from which such well-known conceptions have sprung; but as his work is in all other respects adapted to badly-informed readers, it would have been desirable, on their account, to have supplied these om ssions.

has corrected this latest issue of his papers, down quite to the present time we may mention that under *Nicotiana tabacum*, Lattakia tobacco is included, and it is only within a comparatively recent date that Mr. Thiselton Dyer has shown this to be right, nearly all previous writers having attributed it to *N. rustica*. At the conclusion of the book a very good plan is adopted of classifying the plants mentioned under distinct heads referring to their uses; thus, under alimentary plants, the generic names of all such are placed; the same under dye plants, fibrous plants, and so on. A good index is given of vernacular names only, which is quite sufficient when it is remembered that the scientific names are arranged alphabetically throughout the book.

Notes on the Ancient Glaciers of New Zealand. With Map. By J. C. Russell. Reprinted from the "Annals of the Lyceum of Natural History." (New York: November, 1876.)

MR. RUSSELL was attached to the U.S. Transit of Venus Expedition, and finding himself stationed on the shores of Lake Wakatipu among the snow-fields and glaciers of the South Island of New Zealand he read what had been written on the ice-work of that region and supplemented his reading by the personal observations recorded in these notes. Though he does not add any important new fact to our previous knowledge he gives an interesting *résumé* of the physical geography of the glacier region, pointing out the evidence for the former greater extension of the ice-fields of New Zealand, and dwelling especially on the proofs of enormous erosion shown by the valleys and lake-basins.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Nectar-secreting Glands

I HAVE briefly described in vol. xv. of the Linnean Society's *Journal*, the nectar-glands found at the base of the fronds of the brake fern (*Pteris aquilina*) which are visited by ants for the sake of their sweet secretion. This case seemed to me to show in a striking manner that extra-floral nectar-glands are not necessarily protective in function, because the fern has, in England at least, extremely few enemies. The following extract of a letter lately received from Fritz Müller (of St. Catharina, Brazil) is of considerable interest in relation to this subject. He states that "the honey-glands on our *Pteris aquilina* serve, without doubt, to protect the ferns from the depredations of the leaf-cutting ants (*Ecodoma*), as is the case with *Passiflora*, *Luffa*, and many other plants. The glands of the *Pteris* are eagerly visited by a small black ant, *Crematogaster*, of which the *Ecodoma* seems to stand in great dread. On the other hand, when no protecting ants are present, I have seen *Ecodoma* gnawing the young fronds; here, as in other cases, it is only the young leaves that stand in need of protection, the older ones not being attacked by the leaf-cutting ants." This fact might, no doubt, be used as an argument by those who believe that all nectar-glands were originally developed as protective organs, and this argument would have great force if it could be shown that *Pteris aquilina* is a form which has arisen in countries where protection is needed; but even in that case there would remain the difficulty of accounting for the continued functional activity of the glands in districts where no such protection is required. Or it may be said that in past ages the glands on our European *Pteris* served as a protection against enemies which have now become extinct. But here we are again met by the difficulty of accounting for the continued activity of the glands. It is characteristic of evolution that great changes occur in the functions of organs, and I think that it will generally be allowed that even the most beauti-